Energy Saving Obligations

Cutting the Gordian Knot of leverage?

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ABSTRACT

Better leverage of public funding is essential in order to trigger the investment needed for energy efficiency. In times of austerity governments increasingly look at policy instruments not funded by public expenditure and Energy Savings Obligations represent one option. Because Energy Savings Obligations are paid for by all energy customers, the degree to which they are able to raise additional private capital for energy efficiency investments is crucial with regard to the financial burden on consumers. In this paper, we systematically assess how successful Energy Savings Obligations were in levering capital from parties other than the obligated entities including private investors and other public bodies. We analyse three countries with substantial experience with Energy Savings Obligations, identify the main design differences and the effect this has on the degree of leverage. We conclude that the design of Energy Savings Obligations largely determines the degree of leverage and that that there appears to be a trade-off between high leverage and additionality.

KEYWORDS

Energy Savings Obligation, Leverage, Financing

1. INTRODUCTION

Energy Savings Obligation (ESOs) are a prominent policy instrument for increasing the energy efficiency of the economy - they have been successfully implemented in a growing number of countries all over the world. Within the US, 34 states have implemented different variations of ESOs and 6 EU member states now have on-going ESOs. Also Australia has significant experience with the policy instrument (RAP 2012). The systems differ very much in design, often a result of different regulatory frameworks. In this paper, we will focus on the European ESOs.

ESOs already featured in the EU Energy End-Use Efficiency and Energy Services Directive of 2006 (2006/32/EC) as a possible market-based instrument for realising energy savings. However, the Directive only recommended ESOs and there was no requirement for member states to implement the instrument. This has now changed: The new Energy Efficiency Directive of 2012 (2012/27/EU) includes a requirement in Article 7 that all member states must introduce ESOs. Exemptions from this obligation can be made if member states provide verification of equivalent savings resulting from alternative instruments. So far, the UK, Italy, France, Denmark, the Flanders region, and Poland have introduced ESOs, although in very different forms. Slovenia is about to implement them (Bertoldi 2010).

One reason for the increasing prominence of ESOs is that they are widely considered as an option of using public funding sources (either paid by the taxpayer or via energy bills) to lever private capital at a time of constrained public budgets (Eichhammer 2012). This leverage effect describes the ratio of public funding to private (and in some cases other public) capital. In a scheme that obliges profit-oriented organisations such as energy companies to deliver a certain amount of energy savings it can be expected that the obligated parties utilise approaches with high leverage effects to minimise their cost. Achieving high leverage rates with public funds can be considered the Gordian knot of leverage in policy design.

However, so far no comprehensive analysis exists that compares different ESOs concerning the amount of leverage they create. In this paper, we systematically review three prominent ESOs, namely the UK, France, and Denmark, and compare their results in terms of leverage. The restriction of the paper to the three cases is a result of data availability - in some cases evaluations exist, but those are not available to the public.

The structure of the paper is as follows: First, we analyze different cost allocation paths within the obligation schemes. Second, we define what we mean by leverage and how it applies to ESOs. Third, we provide background information on how ESOs work in general and more specifically in the three countries under investigation. Fourth, we calculate and compare the degree of leverage achieved in the three countries. Finally, we summarise the findings from the different countries and draw conclusions regarding the impact of design differences on leverage.

2. COST ALLOCATION

One common aspect of obligation schemes and other policy instruments is that most schemes do not subsidise the energy efficiency investment by 100 percent and a remaining share of the investment has to be covered by other capital sources. The interest and repayment should be covered by the reduced energy costs resulting from the energy savings. Depending on the investor's financial situation, the capital may come from own capital sources (e.g. personal savings) or may be refinanced by a commercial bank. Thus, the measures themselves are also financed by the same target group as they are implemented by energy consumers. So the main question of cost allocation is how the money is shifted between the different consumers and how the other actors contribute to this mechanism[1].

Within the figures below, the capital flows between the actors are shown. Costs that are not refinanced by another actor, such as administrative costs of the investors, are not shown in the graphs. Figure 1 shows the cost allocation paths within ESOs. The different actors with their corresponding costs are shown and the cost allocation paths are indicated by arrows (whereas the direction of the arrow indicates the flow of capital).

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[1] For a more detailed description of saving obligation principles see Bertoldi (2008)

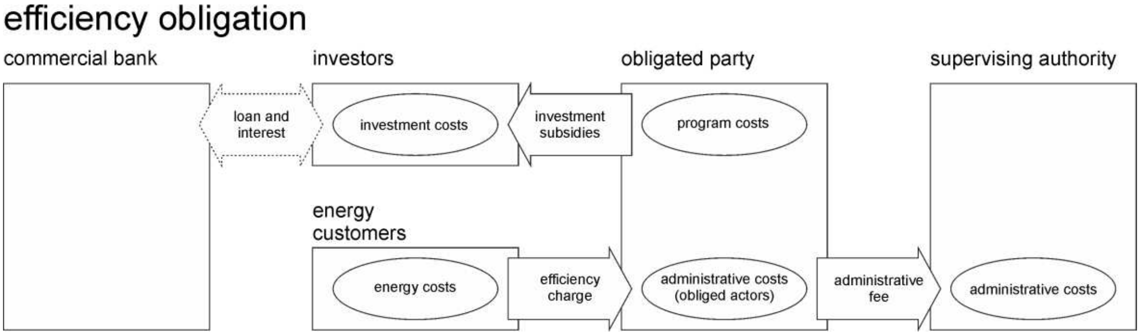

Figure 1: Financing paths of Efficiency Obligations

For energy efficiency obligations five parties have to be considered, namely investors themselves, the energy customers, the obligated parties and a supervising authority. The fifth actor is the commercial banks, which contribute to the financing of the investment. Normally, the obligated party supports the investors by some sort of subsidy to initiate the investment. For the administration of the efficiency scheme, they may have to pay some administrative fees. They refinance themselves through energy prices (or reduced profit) (Schlomann 2013).

Thus, the costs are finally allocated to the energy customers, who normally will pay according to their energy use giving the system a sort of polluter-pays principle. Nevertheless, the energy customers who profit most from the subsidies are not necessarily the ones who pay the final bill, as only those who receive the subsidies profit from lower energy costs. For the obligated parties, it may be easier and cheaper to spend their money on groups with better equity (Rosenow et al. 2013). This could increase leverage, for the need for subsidies is lower than in groups with more difficult access to capital (see section 4.1). To face these issues, ESOs in France and the UK incorporate a social component to ensure that some of the investments are made in deprived groups.

To illustrate the specific mechanism of obligation schemes, the contrasting example of a classical funding scheme is shown in Figure 1.

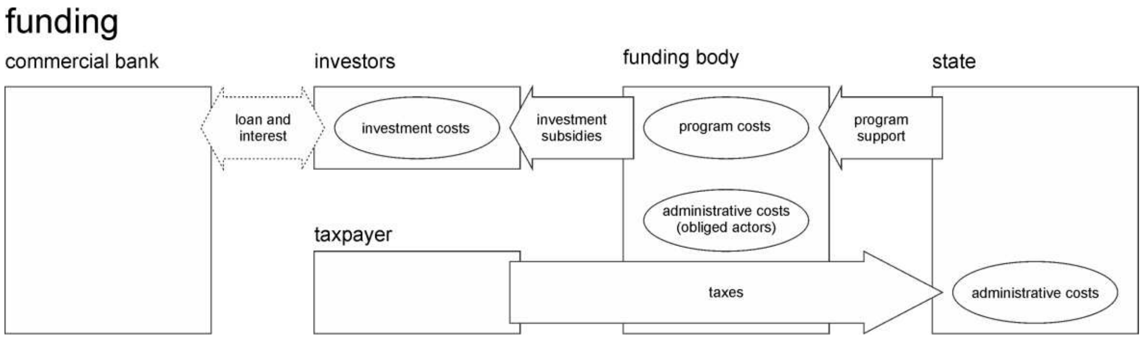

Figure 2: Financing paths of funding schemes

Within a tax based funding scheme the situation is different from an efficiency obligation. Instead of an obligated party, a funding body grants the subsidies, using capital provided by the state, which refinances itself via taxes. The funding body – like the obligated party in the case of efficiency obligations – initiates the investment by granting some form of subsidy.

The costs of the subsidies are finally borne by taxpayers, making it more like an ability-to-pay system. The funding body does not necessarily follow a logic of delivering the most (short-term) savings for their investment, but may follow a more long term investment strategy, making the system less cost-effective on the short term. It may also consider social issues in program design.

Cost allocation is an important issue to discuss when looking at leverage. The main difference between the schemes in terms of cost allocation is the endpoint of the allocation chain. Within a saving obligation it is the energy consumer, within the (tax based) funding scheme it is the taxpayer. The social and political implications of this potential burden to energy customers or tax payers require responsible use of the funds and thus should be a motivation to increase leverage.

3. DEFINING LEVERAGE

In this paper we assume leverage means delivering more investment in energy efficiency by multiplying the finance available from policy induced third party funding sources (subsequently called "public funding", including Government funding through tax revenues and consumer-funded expenditure such as ESOs and public benefits charges)[2]. Regardless of the instrument chosen, most financing mechanisms rely on the consumer or taxpayer as the one who finally pays for the implementation of the energy efficiency measures. As these are all constrained resources, optimal use of the money should be secured.

It is important to appreciate the different types of leverage with regard to energy efficiency programmes as they use different sources of finance and result in potentially different degrees of leverage. The following four types of leverage are most prominent for energy efficiency measures. Options 1-3 fall into the category of continuous support of measures whereas option 4 only provides funding over a short time period assuming this is sufficient to stimulate the market sufficiently.

1. Using **public sources to part-fund a project**, e.g. 50% consumer-funded grant typical in past ESOs in the UK, but also in some Clean Development Mechanism (CDM) funded projects. The remaining proportion of the investment is provided by the beneficiaries themselves.
2. Using **public funds to reduce or remove loan interest rates**, e.g. CO_2-Building Rehabilitation Programme in Germany. The Property Assessed Clean Energy (PACE) mechanism in the US also fits into this category, but uses property tax reductions rather than direct support. The cost of the investment is entirely covered by the beneficiaries.
3. Using **public funds to grant tax breaks**, e.g. reduced VAT rate on some products and income tax reductions as in France and Italy. The tax breaks provided constitute a subsidy toward the overall investment costs.
4. Using **public funds to kick-start markets,** which then become self-sustaining (or at least sustaining at lower rates of support). This could be as support for specific new technologies (e.g. the 100,000 roof programme in Germany supporting solar power) or in support for new business models (such as the Green Deal in the UK). In both cases this requires a dynamic economic analysis in contrast to the other types which are essentially static.

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[2] We exclude policy instruments like product regulation that require private investment with no matching public money.

The additional investment levered is typically provided by the direct beneficiary of the project – usually the building owner and/or occupant, but in principle from other sources as well. For type 2 of the above list, this would generally be banks and other lenders, but this then usually requires the primary beneficiary to repay the loan and any reduced rate interest. For type 1, third parties may include municipalities or social housing providers who part-subsidise energy efficiency measures in order to reach a larger number of participants.

In order to measure leverage we define a leverage factor that is capable of representing the degree of leverage achieved by a given energy efficiency programme. For the purpose of this paper, we measure leverage in form of a leverage factor defined as:

$$L = \frac{C_O + C_B + \sum_{i=1}^{n} C_{Ti}}{C_O + I_a}$$

L = leverage factor

C_O = contribution from obligated party to total investment cost

C_B = contribution from beneficiary to total investment cost

C_T = contributions from any third parties to total investment cost

I_a = other incentives such as tax credits

It follows that leverage is zero for a leverage factor value of 1.0. A leverage factor of 2.0, for example, suggests that contributions from the obligated party were matched with 100% funding from the beneficiary and third parties.

Our computation of leverage factors is based on the cost estimates available for the different countries: Lees (2008, 2006) for the UK; Giraudet et al. (2012) for France; Togeby (2012) for Denmark. The methodology used to derive these estimates is similar across countries.

Regarding how much beneficiaries spend on a given measure, Lees (2006), Togeby (2012) and Giraudet et al. (2012) only take into account the share of investment that is additional to what would have occurred in absence of the obligation. For instance, the full cost of insulation is considered, while only the cost differential between an efficient boiler and a standard one is considered.

Regarding additionality i.e., how many beneficiaries are induced by the obligation, Lees makes the assumption that 20% of the beneficiaries would have invested anyway in the absence of the scheme. The figures he provides are net from any free-rider effects. Differently, the figures provided by Giraudet et al. (2012) assume full additionality of the obligation, as no assessment of free-rider effects could be performed. In Denmark, Bundgaard et al. (2013) assume a rather low additionality of less than 10% for measures in households (i.e. 90% free-riders), but an additionality of more than 50% in industry, which is the main focus of investment in Denmark.

Lastly, Lees (2006) and Giraudet et al. (2012) estimated the indirect cost borne by obligated parties for tasks induced by the obligation, such as marketing or development. These costs are not taken into account in the present study. Rather, the analysis focuses on direct costs, which constitute the main share of the overall costs. For the beneficiaries, the indirect costs are invisible and not relevant in terms of the economics of individual investments in energy efficiency improvements. Using this definition of the leverage factor has the benefit of showing the relative contribution to investments in energy efficiency measures required in order to mobilise private and/or third party capital. It does not, however, account for the total cost such as administration costs and search costs for example. While these costs are not insignificant, estimates for the British scheme show that they are only a small fraction of the total cost (Lees 2008, 2006).

Further limitations of our definition of the leverage factor include the inability to account for non-finance measures such as informational measures that indirectly stimulate the uptake of energy efficiency measures. Further research could develop more sophisticated computations of leverage factors that include such programmes as well.

4. CHARACTERISTICS OF ENERGY SAVINGS OBLIGATIONS

The general concept of an energy saving obligation is to oblige a party to deliver a defined amount of energy savings within a certain time. Those parties are usually final energy suppliers or the distribution network operators, which is the case in all the European systems. But also independent entities can act as the obligated party. For example, the ESO in Vermont is designed in such a way, which resembles very much an energy efficiency funds with a fixed saving target and variable budget.

The energy saving measures that may be undertaken by the obligated parties or other actors have to be monitored. This is usually done by standard saving scores (also known as deemed savings), which rely on engineering estimates often corrected by direct measurements within a representative sample.

ESOs include a trading mechanism, which allows obligated parties and/or other actors to trade certified savings. If traded in an open market, a price for energy savings will be determined and obligated parties can decide to invest in energy savings themselves or buy (white) certificates from other actors.

To secure additionality, the baseline may be set according to existing regulations and policy instruments already in place. Some systems employ a different approach by deliberately allowing an overlap with existing instruments. The main intention of such a system is then to secure a certain level of energy savings and to promote existing instruments to maximise leverage.

We now proceed with a brief overview of the three ESOs discussed in this paper.

4.1 The design of Energy Savings Obligations in the UK

In the UK the ESOs are the most important instrument to deliver energy and carbon savings in the domestic sector (OFGEM, 2005) and both the 2004 and 2007 Energy Efficiency Action Plans highlight ESOs as the principal policy mechanism to deliver energy savings in the domestic sector (2004, 2007). The basic concept of ESOs in Britain is that Government imposes an energy savings target on large energy suppliers (gas and electricity) that has to be achieved at the customer end, which may relate to energy consumption or carbon emissions. Businesses and industrial end-users are not covered by the scheme; they are targeted by other policy instruments such as the Climate Change Levy and Climate Change Agreements, as well as the recently introduced Carbon Reduction Commitment.

The first ESOs in Britain were introduced in 1994. We focus on the Energy Efficiency Commitment (EEC) 1 and 2. EEC 1 was in place from 2002 to 2005 and EEC 2 from 2005 to 2008. EEC was eventually renamed in 2008 to the Carbon Emissions Reduction Target (CERT) that ran from 2008 to 2012.

A distinct feature of the British scheme is the specific targeting of a priority group (PG) in the scheme, which focuses on households in receipt of specified state benefits and elderly residents.

In Britain, energy suppliers comply with their obligations by subsidising energy efficient technologies. There were various routes the energy suppliers used including (Rosenow 2012):

- *Subsidise installers of insulation:* Energy suppliers contracted installers or delivery agents who contract installers of energy saving measures (for example cavity wall insulation) that carry out the work in homes.

- *Subsidise products sold via retail:* Suppliers have subsidised energy efficient products (for example insulation material) sold via ‘do it yourself’ (DIY) markets and other retailers.
- *Subsidise products sent via mail:* Energy companies subsidised certain products, and, for example, promoted the use of compact fluorescent lamps (CFLs) via mass mail-outs of free light bulbs, although this is now prohibited.

4.2 The design of Energy Savings Obligations in France

In France, the first obligation period ran from 2006 to 2009. The second obligation period has been running since 2011 and will last until 2013. All energy suppliers above a certain sales threshold are subject to the obligation. Within the second obligation period, also the gasoline suppliers are among the obligated parties. Differing from the UK saving obligation, the French system covers all energy demand sectors, with eligible measures also in the transport sector.

Unlike in the UK, obligated parties in France do not systematically subsidise energy efficient technologies. They use a broader set of compliance strategies, including:

• Free energy audits and advice: these services are provided for the most part by contracted installers. They are also provided directly by the obligated parties via their call centres or websites.

• Direct subsidies: they tend to target specifically boilers and other measures on heating systems. They are by and large the main compliance strategy used by fuel oil suppliers. In contrast, they are little used by electricity suppliers. Department stores whose gasoline sales are covered by the obligation offer some vouchers for free purchases to customers who buy energy efficient products in their stores.

• Soft loans: Some major obligated parties have their own banks as subsidiaries and use them to offer reduced interest rate loans to consumers.

The French scheme does not exclude overlap with other instruments, so the investors usually combine the subsidies from the saving obligation with various incentives granted for efficiency products. This includes:

• Income tax reliefs for energy efficient products: This policy was implemented in 2005. All the energy efficient products covered are also eligible within the energy saving obligation.

• Zero interest rate loans granted by private banks on behalf of the Government: This policy was implemented in 2009. All the energy efficient products covered are also eligible to the energy saving obligation. However, the overlap between the two instruments is limited by the fact that soft loans can only be granted if several measures are combined, e.g., wall insulation together with an upgrade of the heating system.

4.3 The design of Energy Savings Obligations in Denmark

The Danish ESOs are considered very ambitious, even complying with the 1.5 % target of article 7 of the EED without major system changes. The Danish obligation is set on the distribution companies rather then energy suppliers. The target is set in a cooperative process between the obligated parties and the ministry.

The distribution companies implement their measures together with energy service companies and other actors like energy performance contractors to comply with the obligation.

For the accounting process deemed savings as well as individual assessments are possible depending on the type of measure. Measures from all sectors excluding transport are eligible for the ESOs. The accounting methodology of the savings in the Danish scheme is different from the British and French approach, which uses (discounted) lifetime savings. In Denmark, only the first year savings are taken into account. Some uplift factors are used to account for the different lifetimes of the measures. Nevertheless, the accounting methodology favours measures with shorter lifetimes.

An overlap of the scheme with other instruments is explicitly part of the design. Most of the measures are implemented in enterprises from the industrial and services sector – the French and British ESOs focus mainly on domestic customers. In 2011 the share of savings delivered by enterprises was larger than 60 percent.

5. LEVERAGE – RESULTS FROM ENERGY SAVINGS OBLIGATION IN EUROPE

5.1 The example of the UK

The different routes entail varying degrees of subsidy and contributions from the recipients themselves. Detailed figures exist for the obligation periods 2002-2005 and 2005-2008. The following tables show the contributions for various measures and delivery routes made by energy suppliers, households, and third parties such as Local Authorities or Social Housing Providers. The leverage factors are provided as well (1.0 meaning no leverage i.e. 100% subsidy by supplier and 2.0 representing 50% contribution from the energy supplier and 50% from recipients and third parties). Note that the contribution is paid to the total cost of the investment and the percentages refer to the total direct cost excluding the administration costs.

Table 1: Leverage during EEC 1 2002-05

Delivery route and promoted measure	Subsidy	Contribution from recipient	Contribution from 3rd party	Leverage factor
Subsidise installers of insulation				
Cavity wall insulation				
Able to Pay Customers (ATP)	47%	44%	10%	2.2
Priority Group (PG)[3]	76%	6%	18%	1.3
Loft insulation (top up)				
ATP	46%	29%	25%	2.2
PG	62%	4%	33%	1.6
Loft insulation (virgin)				
ATP	50%	42%	8%	2.0
PG	87%	2%	11%	1.2
Subsidise products sold via retail				
DIY loft insulation				
ATP	36%	64%	0%	2.8
PG	34%	67%	0%	3.0
CFLs				
PG	39%	57%	5%	2.6
ATP	37%	59%	4%	2.7
Subsidise products sent via mail				
CFLs				
ATP	81%	17%	2%	1.2

3 The priority group covers households in receipt of specified state benefits or with elderly residents.

PG	98%	1%	1%	1.0
TOTAL				
ATP	44%	44%	12%	2.3
PG	65%	9%	26%	1.5

Source: own calculations based on Lees (2006)

Overall, leverage during EEC 1 (2002-2005) was about 1.9, i.e. for every euro spent by suppliers almost one euro was contributed by recipients and third parties with a larger share coming from recipients. Leverage was higher for ATP measures (2.3) compared to PG measures (1.5), but PG measures attracted more than twice as much third party finance. The highest leverage was achieved in retail schemes with leverage factors of up to 3.0. This was followed by subsidies to the installation of insulation showing leverage factors of up to 2.2. The lowest leverage factor was achieved in products sent via mail to households, mainly a result of distributing CFLs free of charge.

Table 2: Leverage during EEC 2 2005-08

Delivery route and promoted measure	Subsidy	Contribution from recipient	Contribution from 3rd party	Leverage factor
Subsidise installers of insulation				
Cavity wall insulation				
ATP	60%	37%	3%	1.7
PG	92%	0%	7%	1.1
Loft insulation (top up)				
ATP	50%	41%	9%	2.0
PG	80%	3%	17%	1.3
Loft insulation (virgin)				
ATP	65%	31%	4%	1.5
PG	93%	0%	7%	1.1
Subsidise products sold via retail				
DIY loft insulation				
ATP	30%	70%	0%	3.3

PG	30%	70%	0%	3.3
CFLs				
PG	39%	61%	0%	2.6
ATP	45%	55%	0%	2.2
Subsidise products sent via mail				
CFLs				
ATP	99%	1%	0%	1.0
PG	100%	0%	0%	1.0
TOTAL				
ATP	54%	39%	7%	1.9
PG	86%	2%	12%	1.2

Source: own calculations based on Lees (2008)

During EEC 2 (2005-2008), leverage was just half of what it was during EEC 1 (1.44 compared to 1.87), i.e. for every euro spent by suppliers 44 cents were contributed by recipients and third parties. However, leverage was higher in retail schemes than during EEC 1. The overall picture is similar to EEC 1 with highest leverage achieved in retail schemes and lowest in mail outs.

Note that the figures presented are direct cost contributions to the measures promoted and they do not include any indirect cost to the parties involved.

At the time of writing, no data on CERT (2008-2012) was available. However, it is clear that in the last phase of CERT leverage for schemes subsidising insulation has declined and was even below 1.0 at the end of the scheme for some measures. This is where energy suppliers paid households the full cost of the measure plus an additional incentive.

As we discuss later in chapter 4, the cost allocation is important for the social acceptance of the instrument. Consumer groups with a rather low willingness to pay are less likely to be targeted by the obligated party if no specific provisions are included in the instrument. Therefore, in addition to the existing Priority Group, a Super-Priority Group (SPG) target was introduced in March 2011 as a sub-target within CERT. CERT originally required suppliers to deliver 40% of the targeted emission savings with households deemed to be in the ‘priority group’ (PG), which focused on people who are above 70 years old or receive certain benefits (DECC 2010). The SPG target required suppliers to meet 37.5 % of their PG target (15% of their total CERT target) by delivering measures to a subset of households that were considered to be at high risk of fuel poverty. The SPG differed from the PG because of stricter eligibility requirements regarding recipient's household income and the benefits they receive.

Most suppliers struggled to achieve their SPG targets and because of this some failed to achieve their overall CERT targets within the obligation period, which ended in December 2012. This was the first time that a major supplier has failed to deliver on their obligations. OFGEM granted suppliers an extension period until 31 January to deliver their obligations (OFGEM 2012a). At the end of CERT, suppliers offered incentives for SPG recipients including vouchers toward their fuel bill and cash back schemes. Some suppliers also incentivised referrals by granting those who successfully referred a SPG household a lump sum. Because non-retail schemes for SPG households were fully funded in the last phase of CERT, suppliers were paying 100% + x% incentives resulting in a leverage factor of <1.0, i.e. for every euro suppliers spend they have to spend extra in order to achieve the required uptake.

Similar issues occur with insulation for non-SPG households: As part of the CERT extension in 2011 and for the first time since the inception of the ESO, Government decided to set a minimum share for insulation measures. Subsequently, suppliers were required to achieve 68% of the target under CERT by investing in insulation measures (DECC, 2010). Suppliers were also struggling to meet a target specifying they must achieve at least 68% of their carbon target from March 2011 to January 2013 via insulation measures (DECC, 2010). In June 2012, suppliers had achieved about 65% of their obligation, leaving 35% for the last 6 months. Energy suppliers offered free insulation to everyone, regardless of whether they were in the able-to-pay group the or PG. Hence, leverage for non-retail insulation can be assumed to be zero (i.e. leverage factor of 1.0) for the last phase of CERT.

The above shows that if the targets get tighter, leverage decreases because suppliers find it more difficult to achieve their obligations without fully subsidising the measures. Contributing factors are decreasing potentials for the various measures meaning that fewer opportunities exist leading to more intense competition and more attractive offers with lower leverage. As ESOs in Britain moved towards high cost measures mainly post-2012 (Rosenow and Eyre 2013), the issue of leverage becomes more and more important: Will households be willing to make a contribution to costly measures? If not, the cost for suppliers, which will be passed on to all customers, is going to increase. There is anecdotal evidence that customers are much less willing to make contributions to the high-cost measures leading to lower leverage factors.

5.2 Overlap of instruments – The example of France

The French ESO is Europe’s system with the broadest range of eligible measures. Still, the measures adopted in practice are only a few. During the first period, the installation of efficient boilers was the most prominent among them, accounting for more than half of the measures. Insulation measures were the second largest contributor in terms of energy savings, making the building domain the primary area that received measures as part of the ESOs. This breakdown has not changed much in the second period. As of April 2013, the share of boilers was 35% and insulation was 15% (DGEC 2013).

In the second period, residential buildings still represent 81% of the total energy savings. Compared to the other eligible sectors, residential buildings is the most cost-effective potential for energy savings. This is why, for instance, gasoline suppliers primarily rely on the building sector to generate energy savings, instead of focusing on the transportation sector. Yet within the residential sector, Giraudet et al. (2011) have found that the measures taken in the first period were not necessarily the cheapest. In a competitive market, one would expect the obligated parties to address the most cost-effective measures first, assuming that the required contribution is smaller compared to high-cost measures. This is the point where the interaction of the saving obligation scheme with other measures becomes important. Most prominent among them[4] is the tax credit scheme, which interacts closely with the saving obligation. During the first period of the obligation, the tax cuts granted by the tax credit scheme tended to be higher for measures on the heating system than for measures on the insulation, despite the fact that the latter tend to be more cost-effective.

Using cost figures estimated by Giraudet et al. (2012), leverage for the efficiency measures – set in relation to the additional cost of efficiency measures compared to the baseline, which is directly comparable to estimates found for the UK – was 1.37 in the first period. About 65 % of the additional investment was covered by the tax credit. Considering the overall investment, the tax credits still coverednearly 35% of the total costs. Compared to these values, the direct contribution of the obligated parties to financing is rather limited. In relation to the additional investment, the obligated parties

4No data is available yet about the interaction between the obligation and the soft loan scheme, which was only implemented in 2009.

only contribute 4 % of the investments costs[5]. In relation to the total investment, this amount is even lower, accounting for 2 % only.

Table 3: Leverage within the French obligation Scheme

		Obligated party's cost	Investor's direct costs	Tax Credit Cost	Sum	Leverage Factor
Full Costs	M€	74	2341	1305	3720	
Additional Costs			504		1883	
Full Costs	%	2%	63%	35%	100%	2.70
Additional Costs		4%	27%	69%	100%	1.37

Source: own calculations based on Giraudet et al. (2012)

These figures show that the (direct) leverage effect of the saving obligation scheme is rather low, at least compared to what is observed in the UK. The obligated parties’ contribution to the financing is rather low, compared to the costs borne by the other actors. Therefore the allocation of the leverage effect to the saving obligation scheme is questionable, for the main financial contribution comes from the tax credit scheme. Nevertheless, before the system was introduced, the demand for the tax credits was rather low and was heavily stimulated by the promotion of the obligated parties. Therefore the saving obligation scheme plays an important part in addressing the barriers, which are not only financial.

In the second period, preliminary analysis by ADEME (2013) found that overlap with the tax credit scheme has receded from nearly 100% to only 50%. At the same time, the amount of subsidies offered by obligated parties does not seem to have increased. This is reflected by the fact that the price of white certificates on the trading platform (www.emmy.fr) has been flat and confined between .325c€/kWh to .425c€/kWh over the course of the second period. This price proved to be an accurate proxy for the costs borne by obligated parties in the evaluation of the first period. This suggests that obligated parties have not yet moved towards high-cost energy saving potentials.

5 Direct costs represent only 35% of the total costs incurred by obligated parties in France. In contrast, this share is 85% in the UK.

As a result of the lower contribution from the tax credit and the constant contribution from the obliged parties, the leverage factor should increase in the second period. This increase should however be temporary and followed by a decrease in the longer run, as obligated parties will need to tap harder-to-reach potentials in the future.

Lastly, analysis by ADEME suggests that advice and other information services offered by obligated parties provide consumers with much satisfaction. This suggests that the obligation is effective at inducing the obligated parties to address the information gap.

5.3 Denmark

As described in paragraph 3.4 the Danish obligation scheme is – while comparable to the French scheme in terms of scope – quite different in the actual mix of implemented measures. It is the only European scheme with a substantial share of measures undertaken in the commercial and industrial sector, rather than having a strong focus on domestic buildings. The Italian scheme has changed in that direction over the last few years, but data on that scheme is hard to access in an international context. Because these two groups are quite different in their economic behaviour, they are treated separately in the following considerations.

Table 3 gives an overview of the triggered investments within the Danish obligation scheme.

	Obligated party's cost	Investor's direct costs	Obligated party's cost	Investor's direct costs	Leverage Factor
	DKK/kWh				
Enterprises	0,4	0,8	33%	67%	3
Households	0,4	9,6	4%	96%	25
Average	0,4	2,8	13%	88%	8

Source: own calculations based on Togeby (2012)

In enterprises the leverage is rather low compared to the household sector, still the additional investment is rather high compared to the figures from France and UK. For households (where the main measures are deep renovation and boiler change) the leverage factor is very high compared to the other figures, so with very low capital investment by the obligated party large investments are triggered. About 10 percent of the measures are triggered without any subsidy, but by energy advice only.

However, additionality seems to be an important issue within the Danish obligation scheme. Bundgaard (2013) showed in an evaluation of the scheme, that in households only a minority (<10 %) of the implemented measures are additional. The scheme then acts as a tool for measurement and verification of energy saving measures undertaken anyhow, but does not lead to significant additional investments. In contrast, capital going into such measures may even be withdrawn from more important investment opportunities. Therefore the high leverage factors of the Danish scheme have to be handled with care.

Country synthesis

The important question arising from the presented findings is what factors make the situation in Denmark so different from the British and French situation. The answer mainly lies in the different system designs. Although the general design of the efficiency obligations is very similar in the three countries, some features make a major difference.

The sheer number of measures carried out in the UK[6] shows that the measures are not undertaken in the regular maintenance cycle. For those out of schedule measures, the financial barrier is much more relevant than in case of regular maintenance where only the additional costs of the efficiency measure are relevant for the barriers because the investor/consumer has already decided to do something.

Investment within the regular maintenance cycle applies to the Danish scheme, and therefore the subsidy levels are considerably lower. Thus the leverage effect is much larger than in the UK and France. Within the French scheme there are large windfall gains, due to tax credits for installation of measures that may not be additional. This is nevertheless intended in the system design.

6. CONCLUSION

The required investment in energy efficiency is substantial if the multiple benefits of energy demand reduction are to be realised. However, government budgets are becoming increasingly constrained by austerity measures, making it increasingly difficult to provide the funds needed to finance energy efficiency. Equally, rising energy prices and the reluctance of regulators to add further cost to energy bills limit the ability of ESOs paid for by energy consumers to provide sufficient funding for energy efficiency. Better

6 The CERT Update gives a number of nearly 2.5 million wall insulation measures and 3.5 million loft insulation measures, which covers about 20 % of the British building stock

leverage of public funding, whether provided in the form of grants (paid for by the exchequer) or through ESOs (paid for by energy consumers), is therefore essential.

We argued that ESOs have traditionally been seen as an instrument with a high leverage effect i.e. stimulating investments over and above the funds collected through energy bills from both private investors and other public bodies. However, so far there is no systematic analysis of the ability of ESOs to lever in private and public capital.

As a first step, we defined a leverage factor which can be used to appraise the degree of leverage of ESOs (and potentially other policy instruments). This leverage factor takes into account the amount of public funds provided, the additional private and public capital levered, but also situations where funding from ESOs is blended with further incentives (for example tax rebates). We applied this leverage factor to three prominent ESOs, namely the UK, France and Denmark. Our analysis suggests a wide range of leverage across ESOs and types of energy efficiency measures supported. This spread can largely be explained by the different design features of ESOs and the degree to which the measures supported are additional. In general we found that the higher the leverage factor, the lower the additionality of implemented actions.

ESOs in the UK historically focused on a large number of relatively simple measures that are in most cases not undertaken as part of the regular maintenance cycle requiring a higher contribution in the form of public funds. Furthermore, the UK system has a strong emphasis of social equity, allocating a large proportion of the activity to vulnerable households often on low incomes who cannot make substantial financial contributions. This leads to a lower leverage effect compared to a scheme that focuses entirely on the able-to-pay. The French ESOs display very similar leverage factors as the UK after the effect of tax rebates is taken into account. Without deducting the effect of tax rebates the French system would show a much higher leverage effect. ESOs in Denmark show high leverage factors, particularly in the household sector. However, there is considerable doubt regarding the additionality of some of the measures and further research is required to unravel the dynamics of the Danish scheme.

Future research should focus on how the trade-off between leverage and additionality can be minimised. More sophisticated methods to incorporate the degree of additionality into the leverage factor would allow for a systematic analysis of policy instruments showing the cost and leverage effect for additional energy savings which would be a more appropriate comparator.

REFERENCES

ADEME (2013). Evaluation qualitative du dispositif CEE – 2ème période 2011-2013, Synthèse

Bertoldi, P., Rezessy, S. (2008) Tradable white certificate schemes: fundamental concepts, Energy Efficiency, November 2008, Volume 1, Issue 4, pp 237-255 , Netherlands, Springer

Bertoldi, P. et al. (2010). Energy supplier obligations and white certificate schemes: Comparative analysis of experiences in the European Union, Original Research Article Energy Policy, Volume 38, Issue 3, March 2010, Pages 1455-1469 , Elsevier

Bundgaard, S.-S. et al. (2013). Spending to save: evaluation of the energy efficiency obligation in Denmark, 2013 eceee summer study

DECC (2010). Extending the Carbon Emissions Reduction Target to December 2012.Impact Assessment. London, DECC.

DEFRA (2004). Energy Efficiency: The Government's Plan for Action. London, DEFRA.

DEFRA (2007). UK Energy Efficiency Action Plan 2007. London, DEFRA.

DGEC (2013). Lettre d'information CEE, Avril 2013

Eichhammer, W., Schlomann, B., Rohde, C. (2012). Financing the Energy Efficient Transformation of the Building Sector in the EU. Retrieved 07/10/2013 from http://www.odyssee-indicators.org/publications/PDF/Building-policies-brochure.pdf

Fraunhofer ISI (2009) Study on the the Energy Energy Saving Saving Potentials Potentials in EU Member States, in EU Member States, Candidate Countries and EEA Countries. Karlsruhe.

Giraudet, L.-G., D. Finon, 2011, White certificates schemes: the static and dynamic efficiency of an adaptive policy instrument, CIRED Working Paper No 33-2011

Giraudet, L.-G., Bodineau, L., Finon, D. (2012) The costs and benefits of White Certificates schemes, Energy Efficiency May 2012, Volume 5, Issue 2, pp 179-199, Netherlands, Springer

Heiskanen, Eva, Kaisa Matschoss, and Helka Kuusi (2012). Literature review of key stakeholders, users and investors. Retrieved 13/10/2013 from www.entranze.eu

Lees, E. (2006). Evaluation of the Energy Efficiency Commitment 2002-05. Wantage, Eoin Lees Energy.

Lees, E. (2008). Evaluation of the Energy Efficiency Commitment 2005-08. Wantage, Eoin Lees Energy.

OFGEM (2005). A review of the Energy Efficiency Commitment 2002 – 2005. London, OFGEM.

OFGEM (2012a). Approach to enforcement of the Government's Carbon Emissions Reduction Target (CERT) and Community Energy Saving Programme (CESP)."Retrieved 23/10, 2012, from http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/InfProjMngrs/Documents1/Open%20letter%20CERT%20CESP%20210912.pdf.

OFGEM (2012b). Carbon Emissions Reduction Target update. September 2012. Retrieved 11/10, 2012, from http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/CU/Documents1/OfGem%20CERT%20Q17%20June%202012_v03.pdf.

RAP (2012). "Energy Savings ObligationsGlobal Lessons & the "Efficiency Utility" Model", Presentation at the DENEFF workshop in Berlin October 24, 2012 Retrieved 12/06/2012 from http://www.raponline.org/document/download/id/6244

Rosenow, J. (2012). "Energy Savings Obligations in the UK – A History of Change." Energy Policy 49: 373–382.

Rosenow, J. and N. Eyre (2013) "The Green Deal and the Energy Company Obligation." Proceedings of the ICE - Energy **166**, 127-136.

Rosenow, J., R. Platt and B.Flanagan (2013). "Fuel poverty and energy efficiency obligations – A critical assessment of the supplier obligation in the UK." Energy Policy **62**(0): 1194-1203.

Schlomann, B., Rohde, C., Eichhammer, W., Bürger, V., Becker, D. (2013). Which Role for Market-Oriented Instruments for Achieving Energy Efficiency Targets in Germany?" Energy & Environment, 24(1), 27-56.

Togeby, M. (2012) Evaluering af energiselskabernes energispareaktiviteter, EaEnergianalyse, Kopenhagen 2012 Retrieved 11/12/2012 from: http://www.ens.dk/da-DK/ForbrugOgBesparelser/EnergiselskabernesSpareindsats/Documents/Evaluering2012/Evaluering2012Hovedrapport.pdf